
IMPLEMENTATION PROGRAM

Introduction

This chapter presents the staged development and associated costs of the GPS approach, VISID, weather facilities and GCO improvements recommended in previous chapters. The staging has been divided into three periods to spread the cost, implement the available technology within a reasonable time frame, and provide for the conduct of necessary field surveys and economic justification assessments where applicable. While staging periods cover a 10-year time frame, the benefit/cost analyses considered a 20-year cycle. This has the effect of accelerating the establishment of facilities.

It is recommended that where possible, the facility improvements be installed as part of package procurements. This takes advantage of provisions in the FAA Airport Improvement Program (AIP) which permit state sponsorship of multiple equipment purchases in the interest of reducing overall establishment cost. Facilities that lend themselves to this process are the VISIDS, AWOS and GCO.

FAA programs that may provide for federal installation and maintenance of some of the facility improvements recommended in this Study should be reviewed. This will ensure compatibility between federal and ADOT Aeronautics programs and maximize the investment potential of each effort. The primary federal initiative that is applicable to the improvements addressed in this Study is the FAA Facilities and Equipment (F&E) program, particularly with regard to communications equipment and possible certain visual landing aids. The F&E program is submitted annually for Congressional review and appropriation and is subject to frequent modification. Therefore, ADOT Aeronautics actions to fund improvements that may be included in the F&E program at any given time should be coordinated with the FAA prior to initiating the procurement process.

GPS Approach Procedures

The implementation of GPS procedures is influenced by four principal factors:

1. Whether the procedure is "nonprecision" or dependent on the establishment of the WAAS by the FAA to provide a "precision" approach.
2. The ability of the airport to meet applicable landing surface and design standards.
3. The ability to meet economic justification criteria for those airports requiring improvements to achieve standards.
4. The conduct of compliance standards surveys for airports having limited on-file data.

These factors have been assessed for each airport with a recommended GPS approach procedure. The results lend themselves to a logical grouping in a staged implementation program. A total of seven categories have been defined. Each airport within a category was ranked in priority based on activity levels. This serves to highlight those airports with the relatively greater operational benefits.

The seven categories for GPS approach establishment are defined as follows:

1. Category 1 -- Those airports without an existing IAP and meet the applicable facility design standards for the potential GPS procedure.
2. Category 2 -- Airports without an existing IAP and improvements to meet the facility design standards for the potential GPS procedure are economically justified by achieving a benefit/cost ratio equal to or greater than 1.0. an existing IAP that can be improved with reduced approach minimums and meet the applicable facility design standards.
3. Category 3 -- Airports with an existing IAP that can be improved with reduced approach minimums and meet the applicable facility design standards.
4. Category 4 -- Those airports with an existing IAP that can be improved with reduced approach minimums and improvements to meet the applicable facility design standards are economically justified (benefit/cost ratio equal to or greater than 1.0).

5. Category 5 -- Airports whose potential GPS procedure capability is dependent on improvements to meet applicable facility design standards such that the cost to achieve compliance does not exceed the defined operational benefit value in order to achieve a benefit/cost ratio equal to or greater than 1.0.
6. Category 6 -- Those airports whose GPS procedure is required to provide area coverage.
7. Category 7 -- Airports subject to a standards compliance survey to determine if the costs to meet facility design standards applicable to the potential GPS procedure are economically justified and achieve a benefit/cost ratio equal to or greater than 1.0.

Tables 11-1 through 11-3 present the staged GPS establishment program that takes into consideration the various GPS approach establishment categories. Priority is assigned to those airports which do not require improvements to meet applicable landing surface requirements and facility design standards. This applies first to airports without an instrument approach capability (Category 1) and then to those airports presently served with an instrument approach procedure (Category 2). These airports are included in the Initial Stage.

The Initial Stage also includes the conduct of a number of planning and design activities intended to both improve successively staged airports to meet applicable facility standards. Further, provision is made in the Initial Stage to assess the benefit/cost for airports where the required data is currently unavailable to make such findings. For example, certain airports (Categories 5 and 7) require an assessment of facility development costs in order to test their economic justification by conduct of benefit/cost assessments. Three of the Category 5 airports, none of which are classified as commercial service, could potentially have the need for National Ocean Survey attention due to their reliance on the WAAS. As these airports are surveyed and assessments made regarding their benefit/cost values and economic justification of the approach procedure, ADOTY Aeronautics can sequence each airport in the most appropriate category based on activity levels.

The Intermediate Stage addresses those airports that require facility improvements to support the potential GPS approach procedure. Those airports without an existing instrument approach (Category 3) should precede those that have an instrument approach capability (Category 4).

Airports requiring an instrument approach procedure to support the system objective of area coverage (Category 6) are included in the Final Stage, especially as two of these three airports are dependent on the establishment of the WAAS.

Those airports relying on the establishment of the WAAS for their GPS approach procedure will need to await its availability. In the interim, these airports should undergo the detailed field surveys that identify required latitude, longitude and elevation data points which influence the design of the approach procedure. Requests for such surveys can be made to the National Ocean Survey through the FAA Western-Pacific Region which has been coordinating such surveys in the recent past. If warranted, these airports should then be reassigned to the appropriate implementation/staging category. As an option, ADOT Aeronautics may elect to establish a ground-based, conventional Category I ILS or TLS at the commercial service airports lacking this capability. This option applies to four airports – Kingman, Lake Havasu City Municipal, Laughlin/Bullhead International and Show Low Municipal.

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Table 11-1
GPS APPROACHES STAGING PROGRAM
INITIAL STAGE (YEARS 1 - 4)

<u>Category 1</u>	<u>Category 2</u>	<u>Pre - GPS Approach Planning and Design Activities</u>
<u>Airports Without An IAP And Meet Applicable Facility Design Standards</u>	<u>Airports With An IAP That Can Be Improved And Meet Applicable Facility Design Standards</u>	
Glendale Municipal	Casa Grande Municipal ¹	Initiate and complete improvements to Category 3 and Category 4 airports.
Eloy Municipal	Flagstaff-Pulliam ¹	
Payson	Williams Gateway	
Bagdad	Avi Suquilla	
Cottonwood Municipal	Colorado City Municipal	Conduct field surveys to support WAAS "precision" approaches at airports indicated with * in all groups.
Wickenburg Municipal		
Safford Regional		
Pinal Airpark		
Bisbee Municipal		Assess benefit/cost for Category 5 airports.
Douglas Municipal		
Globe-San Carlos Regional		
Taylor Municipal		
Greenlee County		Conduct standards compliance surveys and assess benefit/cost for Category 7 airports.
Cordes Lake (New)		
Ajo Municipal		
Quartzsite (New)		
Holbrook Municipal		Establish Category I ILS or TLS at 4 commercial service airports (optional).
Tombstone Municipal		
Grand Canyon West		
Rolle Airfield		

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See Appendix A for acronym definitions.

Notes: All airports ranked by activity level per category.

1. GPS approach dependent on establishment of WAAS by FAA.

Source: Table 5-7.

Table 11-2
GPS APPROACHES STAGING PROGRAM
INTERMEDIATE STAGE (YEARS 5 - 7)

<u>Category 3</u>	<u>Category 4</u>	<u>Category 5</u>
<u>Airports Without An IAP And Improvements To Meet Applicable Design Standards Are Justified</u>	<u>Airports With An IAP That Can Be Improved And Improvements To Meet Applicable Facility Design Standards Are Justified</u>	<u>Airports Whose IAP Capability Is Dependent On Not Exceeding A Cost Limitation</u>
Phoenix - Goodyear ¹ Cochise College ¹ Buckeye Municipal Avra Valley ¹	Phoenix - Deer Valley ¹ Laughlin / Bullhead International ¹ Lake Havasu City Municipal ¹	Scottsdale ¹ Mesa-Falcon Field ¹ Chandler Municipal ¹ Stellar Airpark Gila Bend Municipal Kayenta

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 See Appendix A for acronym definitions.

Notes: All airports ranked by activity level per category.

1. GPS approach dependent on establishment of WAAS by FAA.

Source: Table 5-7.

Table 11-3
GPS APPROACHES STAGING PROGRAM
FINAL STAGE (YEARS 8 - 10)

<u>Category 6</u>	<u>Group 7</u>	
<u>Airports Whose IAP Is Required To Provide Area Coverage</u>	<u>Airports Whose Compliance With Applicable Facility Design Standards Are Not Known And Compliance Surveys Are Required</u>	
Libby AAF/Sierra Vista	Memorial Airfield	Flying J Ranch
Page Municipal ¹	Tuba City	Grand Canyon Caverns
Show Low Municipal ¹	Temple Bar	Low Mountain (Closed)
	Chinle	Pinon
	Marble Canyon	Pleasant Valley International
	Whiteriver	Polacca
	San Manuel	Rocky Ridge
	Ak-Chin Community	Shonto
	Rock Point	Sun Valley
	Hualapai Tribal	Ganado
	Pearce Ferry	Greasewood (Closed)
	Sells	Lukachukai
	Cliff Dwellers Lodge	Pine Springs
		Toyol School (Closed)

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 See Appendix A for acronym definitions.

Notes: All airports ranked by activity level per category.

1. GPS approach dependent on establishment of WAAS by FAA.

Source: Table 5-7.

AWOS Facilities

The staged deployment of AWOS facilities is linked to the establishment of GPS approach procedures and presented in Tables 11-4 and 11-5. This rationale serves to maximize the benefit of the instrument procedure and eliminates any potential for the assessment of a remote altimetry penalty. While these GPS approach procedures are in development, it would be advisable to install the recommended AWOS level at those airports which currently are assessed remote altimetry penalties, or whose existing IAP is not authorized when a local altimeter setting is not available. These airports constitute the first set of AWOS units to be deployed in the initial stage. The initial stage also provides for those activities intended to establish the Weather Center. AWOS-3 units required for weather movement coverage (three facilities) are suggested to be installed during the last staging period.

AWOS-3 to AWOS-4 upgrades for the 16 airports recommended in Chapter 7 should be initiated at such time as the private sector produces and receives FAA certification of an AWOS-4. The upgrades can be phased or made concurrently at all 16 airports. In the event of a staged implementation, the sequence might typically follow usual weather movements which are primarily from the west to the east in the northern half of Arizona, and from the south and southwest to the north and northeast in the southern half of the State.

Weather Center

Should the State elect to pursue the establishment of a Weather Center to serve as a focal point for the collection and dissemination of weather data, products and services, its development will need to be integrated consistent with the deployment of AWOS units and on-airport PC equipment. The linkages to TRANSNET and Project EAGLE communications facilities also impact the stage development of the Weather Center. Included in the early stages is the development of the software to access the data collection unit of the AWOS and its transmission to the Weather Center and selected gateways.

VISAIDS

The staging of VISAIDS should typically occur concurrent with other capital improvements programmed for the airport. In general, priority should be given to project items involving basic facilities such as the wind indicator/cone, runway edge lighting/reflectors and visual approach guidance indicators.

Table 11-4
AWOS FACILITIES STAGING PROGRAM
INITIAL STAGE (YEARS 1 - 4)

**AWOS Units At Airports With
Existing Remote Altimetry Penalties
Or Nonauthorized IAP When Local
Altimeter Setting Is Not Available**

Avi Suquilla
Cochise County
Coolidge Municipal
Laughlin / Bullhead International
Mesa - Falcon Field
Show Low Municipal
Springerville Babbit Field
Williams Gateway

**AWOS Units To Complement
GPS Approach Categories 1 And 2
Airports (Table 11-1)**

Glendale Municipal
Eloy Municipal
Payson
Bagdad
Cottonwood Municipal
Wickenburg Municipal
Pinal Airpark
Bisbee Municipal
Douglas Municipal
Globe - San Carlos Regional
Greenlee County
Cordes Lake (New)
Ajo Municipal
Quartzsite (New)
Grand Canyon West

Weather Center Activities

Install weather server

Coordinate telecommunications
requirements with TRANSNET
and Project EAGLE agencies

Write software for Weather Center

Install PCs at AWOS-3 airports

Install telephone lines and modems
to access Weather Center and
DUATS / OASIS

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See Appendix A for acronym definitions.
Sources: Table 5-2 and Table 11-1.

Table 11-5
AWOS FACILITIES STAGING PROGRAM
INTERMEDIATE STAGE (YEARS 5 - 7) AND
FINAL STAGE (YEARS 8 - 10)

<u>Intermediate Stage (Years 5 - 7)</u>	<u>Final Stage (Years 8 - 10)</u>	
AWOS Units To Complement GPS Approach Category 3, 4 and 5 Airports (Table 11-2)	AWOS Units To Complement GPS Approach Category 6 And 7 Airports (Table 11-3) And For Weather Movement Coverage	Upgrade AWOS-3 Units To AWOS-4 Capability
Phoenix - Goodyear Cochise College Buckeye Municipal Stellar Airpark Gila Bend Municipal Kayenta	Memorial Airfield Tuba City Temple Bar Chinle Marble Canyon San Manuel Sells Grand Canyon Caverns Polacca Dateland (non - airport location) Tuweep H.A. Clark Memorial	Laughlin / Bullhead International Avi Suquilla Payson Wickenburg Municipal Show Low Municipal Gila Bend Municipal Cochise County Chinle Tuba City Globe - San Carlos Regional Colorado City Municipal Sells Grand Canyon Caverns H.A. Clark Memorial Polacca Dateland (non- airport location)

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 See Appendix A for acronym definitions.

Sources: Table 11-2 and Table 11-3.

GCO Facilities

The provision of a GCO at the relatively more active airports that are not presently served with a federal facility can result in early and positive benefits. The technology is readily available for establishment and the cost manageable as a block purchase. Consequently, the establishment of GCO facilities at all eligible airports is recommended in the initial staging period.

Establishment and Operating Costs

Table 11-6 presents a summary of the unit establishment costs for each principal development improvement. These costs can then be summed to derive the total costs for each staging period as presented in Table 11-7 which also includes allowances for maintenance and facility replacement costs as discussed in the sections below. For the purposes of this evaluation, it was considered that the WAAS is established by the FAA during the intermediate staging period and that the VISAIDS would be installed throughout the course of the staging periods in nearly equal budget allocations. Table 11-8 allocates the total costs by airport.

Maintenance Costs

Maintenance costs center on those capital improvements associated with the approach lighting system and weather facilities. GPS instrument approaches do not require maintenance by the State or local airport with the exception of normal operating costs associated with the runway and its edge lighting. VISAID and GCO facilities are also not subject to significant maintenance costs.

Unit maintenance costs for an AWOS-3 are \$4,000 per year; an AWOS-A will require an average annual outlay of \$700. The AWOS-4 annual maintenance cost should approximate \$5,000. Annual maintenance costs for a MALSR are about \$9,000 and for a SSALS approximately \$5,400. Maintenance costs were assigned to the required 28 new AWOS-3, 13 AWOS-A units 16 AWOS-3 units to be upgraded to an AWOS-4 capability. Maintenance responsibilities for the existing 8 AWOS-3 units continue with the local airport sponsor unless the unit is recommended for upgrade. This situation arises only for the AWOS-3 currently installed at Colorado City Municipal.

Replacement Costs

The State/local responsibility for the improvements presented in this study extends beyond establishment and maintenance functions. As new technological applications arise and equipment ages, a fund should be established (sinking fund) to replace previously installed facilities. The sinking fund is best suited to those improvements with a life span of about 10 years. This would include the AWOS, GCO, Weather Center hardware and software, and airport PC facilities.

Replacement costs can be based on an amortization schedule of 10 years at an interest rate of 7 percent. These funds are set aside by the State/local airport sponsor and do not provide for federal funding participation in eligible items. This is a conservative approach to facility resource funding management because the future availability of federal funds in terms of an aid to airports program is questionable, or the priority of these projects may be insufficiently low to preclude such participation. On this basis, the annual funding requirement for the 28 AWOS-3 units, 8 existing non-federal AWOS-3 units, 13 AWOS-A units, 12 GCO facilities, the Weather Center hardware/software and 36 airport PCs are as previously presented in Table 11-7.

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Table 11-6
**UNIT ESTABLISHMENT AND
ANNUAL MAINTENANCE COSTS**

Facility Improvement	Costs (\$)	
	Establishment	Annual Maintenance
<u>GPS - Related Facilities</u>		
MALSR	250,000	9,000
SSALS	150,000	5,400
<u>Weather Facilities</u>		
AWOS-A	10,000	700
AWOS-3	75,000	4,000
AWOS-3 to AWOS-4 Upgrade	100,000	5,000
Airport PC to DUATS / OASIS	1,500	NIL
Weather Server	50,000	NIL
Weather Center Software	100,000	NIL
<u>VISAIDS</u>		
Wind Indicator	2,000	NIL
Segmented Circle	5,000	NIL
Medium Intensity Rotating Beacon	10,000	NIL
Runway Reflectors (per 1,000 feet)	1,000	NIL
Visual Guidance Indicator	20,000	NIL
Pilot Controlled Lighting	3,000	NIL
Medium Intensity Runway Edge	6,000 +	
Lighting (per 1,000 feet)	10,000 for regulator	NIL
<u>Communications</u>		
GCO	12,000	NIL

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See Appendix A for acronym definitions.
Source: QED.

Table 11-7
STAGED ESTABLISHMENT AND ANNUAL COSTS

Expense Category		Establishment Cost (\$)		
Establishment Cost for Facilities	Total	Initial Stage	Intermediate Stage	Final Stage
MALSR	2,750,000	0	2,000,000	750,000
SSALS	150,000	150,000	0	0
AWOS-A	130,000	90,000	10,000	30,000
AWOS-3	2,100,000	1,050,000	375,000	675,000
AWOS-3 to AWOS-4 Upgrade	1,600,000	0	0	1,600,000
Weather Center	204,000 ¹	204,000	0	0
VISAIDS	2,463,000	821,000	821,000	821,000
GCO	132,000	132,000	0	0
Total	9,529,000	2,447,000	3,206,000	3,876,000
Category I ILS or TLS (Optional)	2,000,000	2,000,000	0	0
Annual Maintenance²				
MALSR	99,000	0	72,000	99,000
SSALS	5,400	5,400	5,400	5,400
AWOS-A	9,100	6,300	7,000	9,100
AWOS-3	112,000 / 48,000 ³	56,000	76,000	48,000
AWOS-4	0 / 80,000	0	0	80,000
Total	225,500 / 241,500	67,700	160,400	241,500
Annual Operating				
NADIN Data Entry	10,000	10,000	10,000	10,000
Telecommunications	25,900	15,800	19,500	25,900
Total	35,900	25,800	29,500	35,900
Annual Replacement Fund				
AWOS	402,900	402,900	402,900	402,900
Weather Center (Public or Private)	29,100	29,100	29,100	29,100
GCO	18,800	18,800	18,800	18,800
Total	450,800	450,800	450,800	450,800
Total Establishment Cost Without Optional Facilities	9,529,000	2,447,000	3,206,000	3,876,000
Total Establishment Cost With Optional Facilities	11,529,000	4,447,000	3,206,000	3,876,000
Total Annual Cost	712,200 / 728,200	544,300	640,700	728,200

See Appendix A for acronym definitions.

Notes: 1. Reflects either public or private sector development cost.

2. Intermediate and final stages reflect cumulative annual maintenance costs.

3. Reduction in total expenses due to the upgrade of 16 AWOS-3 units to AWOS-4 capability.

Sources: Table 11-1, Table 11-2, Table 11-3, Table 11-4, Table 11-5 and Table 11-6.

Table 11-8

SYSTEM AIRPORT FACILITY ESTABLISHMENT COSTS

Airport	Airport Roles	Establishment Cost (\$)					Total
		MALSR / SSALS ¹	AWOS ²	AWOS-3 Upgrade ³	VISAIDS ⁴	GCO ⁵	
Ajo Municipal	GA - P	0	75,000	0	0	0	75,000
Ak-Chin Community	GA - S	0	0	0	65,700	0	65,700
Avi Suquilla	GA - P	0	75,000	100,000	0	12,000	187,000
Avra Valley	RL - P	250,000	0	0	0	12,000	262,000
Bagdad	GA - P	0	75,000	0	28,000	0	103,000
Benson Municipal (New)	GA - P	0	0	0	0	0	0
Bisbee Douglas International	GA - P	0	10,000	0	0	0	10,000
Bisbee Municipal	GA - P	0	0	0	0	0	0
Bowie	GA - S	0	0	0	28,900	0	28,900
Buckeye Municipal	GA - P	0	75,000	0	8,000	0	83,000
Casa Grande Municipal	GA - P	0	0	0	3,000	12,000	15,000
Chandler Municipal	RL - P	250,000	0	0	0	12,000	262,000
Chinle	GA - S	0	75,000	100,000	73,200	0	248,200
Cliff Dwellers Lodge	GA - S	0	0	0	55,900	0	55,900
Cochise College	GA - P	0	75,000	0	3,000	12,000	90,000
Cochise County	GA - P	0	75,000	100,000	3,000	0	178,000
Colorado City Municipal	GA - P	0	0	100,000	0	0	100,000

Table 11-8
SYSTEM AIRPORT FACILITY ESTABLISHMENT COSTS

Airport	Airport Roles	MALSR / SSALS ¹	Establishment Cost (\$)				Total
			AWOS ²	AWOS-3 Upgrade ³	VISAIDS ⁴	GCO ⁵	
Coolidge Municipal	GA - P	0	10,000	0	0	0	10,000
Cordes Lake (New)	GA - P	0	10,000	0	0	0	10,000
Cottonwood Municipal	GA - P	0	75,000	0	0	12,000	87,000
Douglas Municipal	GA - P	0	10,000	0	0	0	10,000
Duncan-O'Connor Field (Closed)	GA - S	0	0	0	29,000	0	29,000
Eloy Municipal	GA - P	0	75,000	0	23,000	12,000	110,000
Ernest A. Love Field	CS - P	0	0	0	0	0	0
Estrella Sailport	GA - P	0	0	0	22,500	0	22,500
Flagstaff-Pulliam	CS - P	0	0	0	0	0	0
Flying J Ranch	GA - S	0	0	0	65,500	0	65,500
Ganado	GA - S	0	0	0	71,000	0	71,000
Gila Bend Municipal	GA - P	0	75,000	100,000	20,000	0	195,000
Glendale Municipal	RL - P	150,000	10,000	0	0	0	160,000
Globe-San Carlos Regional	GA - P	0	75,000	100,000	0	0	175,000
Grand Canyon Bar-Ten	GA - S	0	0	0	31,600	0	31,600
Grand Canyon Caverns	GA - S	0	75,000	100,000	78,600	0	253,600

Table 11-8
SYSTEM AIRPORT FACILITY ESTABLISHMENT COSTS

Airport	Airport Roles	Establishment Cost (\$)					Total
		MALSR / SSALS ¹	AWOS ²	AWOS-3 Upgrade ³	VISAIDS ⁴	GCO ⁵	
Grand Canyon National Park	CS - P	0	0	0	0	0	0
Grand Canyon West	GA - S	0	10,000	0	76,000	0	86,000
Greasewood (Closed)	GA - S	0	0	0	78,200	0	78,200
Greenlee County	GA - P	0	10,000	0	25,000	0	35,000
H.A. Clark Memorial Field	GA - P	0	75,000	100,000	20,000	0	195,000
Holbrook Municipal	GA - P	0	0	0	0	0	0
Hualapai Tribal	GA - S	0	0	0	73,200	0	73,200
Kayenta	GA - P	0	75,000	0	23,000	0	98,000
Kearny	GA - S	0	0	0	22,900	0	22,900
Kingman	CS - P	0	0	0	3,000	0	3,000
Lake Havasu City Municipal	CS - P	250,000	0	0	0	12,000	262,000
Laughlin/Bullhead International	CS - P	250,000	75,000	100,000	0	12,000	437,000
Libby AAF/Sierra Vista	GA - P	250,000	0	0	0	0	250,000
Low Mountain (Closed)	GA - S	0	0	0	61,100	0	61,100
Lukachukai	GA - S	0	0	0	70,100	0	70,100
Marble Canyon	GA - S	0	10,000	0	65,700	0	75,700

Table 11-8
SYSTEM AIRPORT FACILITY ESTABLISHMENT COSTS

Airport	Airport Roles	Establishment Cost (\$)					Total
		MALSR / SSALS ¹	AWOS ²	AWOS-3 Upgrade ³	VISAIDS ⁴	GCO ⁵	
Memorial Airfield	GA - S	0	10,000	0	74,200	12,000	96,200
Mesa-Falcon Field	RL - P	250,000	75,000	0	0	0	325,000
Nogales International	GA - P	0	0	0	79,100	0	79,100
Page Municipal	CS - P	250,000	0	0	0	0	250,000
Payson	GA - P	0	75,000	100,000	3,000	0	178,000
Pearce Ferry	GA - S	0	0	0	60,600	0	60,600
Phoenix-Deer Valley	RL - P	250,000	0	0	0	0	250,000
Phoenix-Goodyear	RL - P	250,000	75,000	0	0	0	325,000
Phoenix Sky Harbor International	CS - P	0	0	0	0	0	0
Pinal Airpark	GA - P	0	10,000	0	23,000	0	33,000
Pine Springs	GA - S	0	0	0	71,700	0	71,700
Pinon	GA - S	0	0	0	69,200	0	69,200
Pleasant Valley International	GA - S	0	0	0	66,700	0	66,700
Polacca	GA - S	0	75,000	100,000	38,000	0	213,000
Quartzsite (New)	GA - P	0	10,000	0	0	0	10,000
Rock Point	GA - S	0	0	0	72,800	0	72,800

Table 11-8
SYSTEM AIRPORT FACILITY ESTABLISHMENT COSTS

Airport	Airport Roles	Establishment Cost (\$)					Total
		MALSR / SSALS ¹	AWOS ²	AWOS-3 Upgrade ³	VISAIDS ⁴	GCO ⁵	
Rocky Ridge	GA - S	0	0	0	63,000	0	63,000
Rolle Airfield	GA - S	0	0	0	59,800	0	59,800
Ryan Airfield	RL - P	0	0	0	3,000	0	3,000
Safford Regional	GA - P	0	0	0	3,000	0	3,000
San Carlos	GA - S	0	0	0	32,300	0	32,300
San Manuel	GA - S	0	10,000	0	0	0	10,000
Scottsdale	RL - P	250,000	0	0	0	0	250,000
Sedona	GA - P	0	0	0	0	0	0
Seligman	GA - S	0	0	0	29,500	0	29,500
Sells	GA - S	0	75,000	100,000	83,000	0	258,000
Shonto	GA - S	0	0	0	71,000	0	71,000
Show Low Municipal	CS - P	250,000	75,000	100,000	0	0	425,000
Springerville Babbit Field	GA - P	0	75,000	0	0	0	75,000
St. Johns Industrial Airpark	GA - P	0	0	0	0	0	0
Stellar Airpark	GA - P	0	10,000	0	42,000	12,000	64,000
Sun Valley	GA - S	0	0	0	62,200	0	62,200

Table 11-8
SYSTEM AIRPORT FACILITY ESTABLISHMENT COSTS

Airport	Airport Roles	Establishment Cost (\$)					Total
		MALSR / SSALS ¹	AWOS ²	AWOS-3 Upgrade ³	VISAIDS ⁴	GCO ⁵	
Superior Municipal	GA - S	0	0	0	28,500	0	28,500
Taylor Municipal	GA - P	0	0	0	0	0	0
Temple Bar	GA - S	0	75,000	0	64,000	0	139,000
Tombstone Municipal	GA - S	0	0	0	75,700	0	75,700
Toyol School (Closed)	GA - S	0	0	0	75,200	0	75,200
Tuba City	GA - P	0	75,000	100,000	3,000	0	178,000
Tucson International	CS - P	0	0	0	0	0	0
Tuweep	GA - S	0	75,000	0	28,400	0	103,400
Whiteriver	GA - P	0	0	0	25,000	0	25,000
Wickenburg Municipal	GA - P	0	75,000	100,000	0	0	175,000
Williams Gateway	RL - P	0	75,000	0	8,000	0	83,000
Window Rock	GA - P	0	0	0	0	0	0
Winslow Municipal	GA - P	0	0	0	0	0	0
Dateland (non-airport)	Not Apl	0	75,000	100,000	0	0	175,000

Table 11-8
SYSTEM AIRPORT FACILITY ESTABLISHMENT COSTS

Airport	Airport Roles	Establishment Cost (\$)					Total
		MALSR / SSALS ¹	AWOS ²	AWOS-3 Upgrade ³	VISAIDS ⁴	GCO ⁵	
GPS / AWOS / VISAID / GCO Total		2,900,000	2,230,000	1,600,000	2,463,000	132,000	9,325,000
Weather Network							204,000
Category I ILS or TLS Optional Installation ⁶							2,000,000
System Total Without Optional ILS or TLS Facilities							9,529,000
System Total With Optional ILS or TLS Facilities							11,529,000

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Note: See Appendix A for acronym definitions.

- Sources:
1. Table 5-6 and Table 11-7.
 2. Table 7-3 and Table 11-7.
 3. Chapter 7 and Table 11-7.
 4. Table 6-2 and Table 11-7.
 5. Chapter 8 and Table 11-7.
 6. Chapter 11 (Kingman, Lake Havasu City, Laughlin / Bullhead nd Show Low)

Funding Options

Certain of the capital improvements recommended in this study may be eligible for funding under the FAA AIP. Federal participation for eligible projects was estimated at 91.06 percent of the establishment cost. Such funding would apply to all the facilities except those associated with the Weather Center, representing an investment of \$204,000, and the optional establishment of Category I ILS or transponder landing system facilities at 4 airports at a total cost of \$2,000,000. The latter costs are assigned in total to the State. However, due to limited federal funding levels, participation for eligible items may not be viable and possibly not without long lead times. Consequently, the allocation of establishment costs among the federal, state and local airport sponsor/owner entities is presented for three scenarios as shown in Table 11-9.

Table 11-10 presents possible ranges of federal, State and local sponsor financial requirements to establish the required facilities based on the data presented in Table 11-8 and Table 11-9.

ADOT Aeronautics derives revenues from several principal sources. These include flight property taxes, aviation avgas fuel taxes, aircraft lieu taxes and aircraft registration fees. Of these, the flight property tax assessed on the value of scheduled airline aircraft has, over the past 5 years, represented about 80 percent of all revenues. In fiscal year 1997, total revenues were slightly more than \$23.1 million and represented an increase of nearly 60 percent from the level received in fiscal year 1993. Over the past 5 years, revenues have averaged some \$18.7 million.

Revenues are used to offset the administrative expenses of the ADOT Aeronautics which over the past 5 years has averaged about \$740,000 and airport development grants which accounted for an investment of some \$10,270,000 on average. The latter are used to match federal grants for eligible projects, or to fund improvements that are not otherwise federally-eligible but meet State eligibility requirements and satisfy airport and aviation system needs.

Through fiscal year 1997, expenditures have kept pace with revenues although a moderate reserve was accrued. Future budgets for ADOT Aeronautics through fiscal year 2003 reflect a spend-down of the accumulated reserve, however, the values reflect outlays for capital development consistent with previous years' levels, averaging nearly \$18.5 million annually.

The financial requirement of the State to establish the facilities recommended in this study could range from about \$2.8 million to \$10.8 million over a 10-year period. Assuming that no federal funding participation is received, as represented by funding Scenario 3 in Table 11-10, the required investment averages slightly more than \$1 million per year. This sum represents about five percent of the average annual revenues in past years and, on surface, appears to be financially viable. As always, the investment in required facilities to serve the aviation public is competitive. Because the facility requirements presented in this study have been based on technical needs and tests of economic justification, their competitive advantage is enhanced and support for their establishment is strengthened.

Maintenance Costs

The on-going need to fund annual maintenance and operating expenses for the facilities and their replacement fund represents an additional expense item to be borne by the local airport owner/operator and the State. Those annual costs related to approach lighting systems, AWOS and GCO facilities are best allocated to the local airport owner/operator and account for \$663,200. The State's annual costs to maintain, operate and provide replacement funds for the NADIN data entry, telecommunications and Weather Center are \$65,000. Upon the upgrade of 16 AWOS-3 units to AWOS-4 capability, the annual costs for these units would shift to the State.

Telecommunications Costs

The primary telecommunications costs include the local telephone number and modem line to each AWOS location (\$360 annually) for connection to the TRANSNET or Project EAGLE facilities. It is assumed that no charges will be assessed to transmit data over these State communications networks and facilities. There is an annual allowance of \$10,000 for the vendor interface to NADIN. At each airport equipped with an AWOS-3, the telephone number and modem connection to DUATS/OASIS will incur an annual cost of \$360.

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Table 11-9

FUNDING PARTICIPATION SCENARIOS

Airport System Role	Distribution Applicable to	Scenario 1 Funding Distribution (percent)			
		Federal	State	Local	Total
Commercial Service	All	91.06	4.47	4.47	100.00
Reliever	All	91.06	4.47	4.47	100.00
General Aviation	All	91.06	4.47	4.47	100.00
Non-Airport Location	All	0.00	100.00	0.00	100.00
Weather Center Facilities	All	0.00	100.00	0.00	100.00
Category I ILS or TLS (Optional)	All	0.00	100.00	0.00	100.00

Airport System Role	Distribution Applicable to	Scenario 2 Funding Distribution (percent)			
		Federal	State	Local	Total
Commercial Service	All	91.06	4.47	4.47	100.00
Reliever	50%	91.06	4.47	4.47	100.00
Reliever	50%	0.00	90.00	10.00	100.00
General Aviation - Primary	All	0.00	90.00	10.00	100.00
General Aviation - Secondary	All	0.00	95.00	5.00	100.00
Non-Airport Location	All	0.00	100.00	0.00	100.00
Weather Center Facilities	All	0.00	100.00	0.00	100.00
Category I ILS or TLS (Optional)	All	0.00	100.00	0.00	100.00

Airport System Role	Distribution Applicable to	Scenario 3 Funding Distribution (percent)			
		Federal	State	Local	Total
Commercial Service	All	0.00	90.00	10.00	100.00
Reliever	All	0.00	90.00	10.00	100.00
General Aviation - Primary	All	0.00	90.00	10.00	100.00
General Aviation - Secondary	All	0.00	95.00	5.00	100.00
Non-Airport Location	All	0.00	100.00	0.00	100.00
Weather Center Facilities	All	0.00	100.00	0.00	100.00
Category I ILS or TLS (Optional)	All	0.00	100.00	0.00	100.00

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 See Appendix A for acronym definitions.

Source: QED.

Table 11-10
ESTABLISHMENT FUNDING SOURCES SCENARIOS

Airport System Role	Distribution Applicable to	Scenario 1 Funding Distribution (\$)			
		Federal	State	Local	Total
Commercial Service	All	1,258,449	61,775	61,775	1,382,000
Reliever	All	1,743,799	85,601	85,601	1,915,000
General Aviation	All	5,329,742	261,629	261,629	5,853,000
Non-Airport Location	All	0	175,000	0	175,000
Weather Center Facilities	All	0	204,000	0	204,000
Category I ILS or TLS (Optional)	All	0	2,000,000	0	2,000,000
Total		8,331,990	2,788,005	409,005	11,529,000

Airport System Role	Distribution Applicable to	Scenario 2 Funding Distribution (\$)			
		Federal	State	Local	Total
Commercial Service	All	1,258,449	61,775	61,775	1,382,000
Reliever	50%	871,900	42,800	42,800	957,500
Reliever	50%	0	861,750	95,750	957,500
General Aviation - Primary	All	0	2,700,720	300,080	3,000,800
General Aviation - Secondary	All	0	2,709,590	142,610	2,852,200
Non-Airport Location	All	0	175,000	0	175,000
Weather Center Facilities	All	0	204,000	0	204,000
Category I ILS or TLS (Optional)	All	0	2,000,000	0	2,000,000
Total		2,130,349	8,755,636	643,016	11,529,000

Airport System Role	Distribution Applicable to	Scenario 3 Funding Distribution (percent)			
		Federal	State	Local	Total
Commercial Service	All	0	1,243,800	138,200	1,382,000
Reliever	All	0	1,723,500	191,500	1,915,000
General Aviation - Primary	All	0	2,700,720	300,080	3,000,800
General Aviation - Secondary	All	0	2,709,590	142,610	2,852,200
Non-Airport Location	All	0	175,000	0	175,000
Weather Center Facilities	All	0	204,000	0	204,000
Category I ILS or TLS (Optional)	All	0	2,000,000	0	2,000,000
Total		0	10,756,610	772,390	11,529,000

See Appendix A for acronym definitions.

Note: State and grand totals in each scenario are each reduced by \$2,000,000 if optional Category I ILS or TLS facilities are not established.

Sources: Table 11-8 and Table 11-9.

State Versus Contract Management

The State does not presently have the technical manpower to install, monitor, operate or maintain the approach lighting systems and AWOS facilities. To provide for this capability, the State would need to hire new staff experienced in the field of electronics and certified by the FAA on each type of facility. Alternatively, the State could procure the required professional services and provide overall program management direction. The appropriate course of action essentially involves a policy decision by State government. This decision making process must also consider the element of liability and the degree of risk the State wishes to assume. Generally, the cost to provide a total in-house capability should be about 15 percent less than the use of contract services, exclusive of the State's cost to hire, train and administer these new personnel. Therefore, when all costs are considered, the difference between an in-house capability and contract services is substantially narrowed. The use of contract services provides the State with a reduced liability exposure. Because there is a large source of experienced personnel in the private sector within the State, and in view of the potential liability exposure, contract services are preferable.

This reasoning can be extended to the individual airport sponsor/owner. This party, through acceptance of an approach lighting system and/or AWOS unit established with full or partial State funding, will be required to effect a maintenance program for the facility. When the elements of cost and liability are reviewed by the sponsor, it is likely that the procurement of a qualified outside service for the maintenance function will also be elected. Therefore, there exists a situation wherein the State can serve in a program management role to organize a contractor service to maintain all equipment established. This arrangement provides the benefits of economies of scale, continuity in the means and procedures followed to effect the maintenance and monitoring functions, and an ability to minimize startup and commissioning time. Further, the contractor can establish a statewide program involving such management issues as hiring, training, administration, spare parts management, record keeping, and interface with the FAA through non-federal certification procedures. Consequently, it is suggested that the State establish a contract service for the approach lighting systems and AWOS units. This conclusion then leads to the consideration of whether it is better to procure the services of a single contractor or multiple contractors. Further, there may be a need to separate the contractor function by geographic region and/or skill specialty.

The single contractor provides the opportunity for more efficient coordination and reduced administrative expenses. However, there may not be a sufficient number of such single-source capability contractors spanning the range of technology requirements. Consequently, contractual costs may be higher due to

the reduced competitive environment. The use of multiple contractors incorporates additional coordination and administrative requirements on the State. This would occur for awards based on a geographic region or specialty basis. However, the contractual cost could be reduced because of shorter travel distances involved to service the facilities in the case of a geographic distribution, or because highly specialized skills may be procured at a lower rate due to the efficiency with which these individuals perform their work.

Ultimately, the marketplace will establish the most effective means to acquire the contractual services. The State should announce its requirements to monitor and maintain the facilities and allow the respondent to formulate an appropriate proposal. The State should be willing to entertain all proposals that address its specified needs. It must be emphasized that the provision of contract services be in accordance with standards and procedures developed by the FAA for each specific type of equipment.

Public Versus Private Funding Participation

This section seeks to identify potential public versus private sector solutions to establish and maintain certain of the capital improvements recommended in this study. In order to promote private sector participation to establish and maintain facilities, there needs to be a means to generate revenue from such activities. Consequently, only those facilities associated with the collection and dissemination of weather data, products and services lend themselves to such a situation. This would apply to the AWOS units, Weather Center, on-airport PC and telecommunications facilities. There is also the opportunity to consider a public/private partnership arrangement due to the existing and planned improvement of telecommunications facilities by the State. The advantages and disadvantages for each avenue of action are summarized in Table 11-11 through Table 11-13 and discussed below.

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Table 11-11
**WEATHER CENTER ORGANIZATION
PUBLIC SECTOR OPTION**

Advantages	Disadvantages
<ol style="list-style-type: none">1. Total control by State.2. Eligible to receive federal funding.3. Contributes to multimodal response from within Arizona DOT.4. Enhances working relationship with other State agencies.5. Opportunity for commercialization of travel information and advertising.6. Potential for ITS demonstration program.	<ol style="list-style-type: none">1. Diverts limited public funds from other potential projects.2. Requires training of staff to operate and maintain Weather Center equipment and facilities.3. State not accustomed to commercialization role.

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Source: QED.

Table 11-12
**WEATHER CENTER ORGANIZATION
PRIVATE SECTOR OPTION**

Advantages	Disadvantages
<ol style="list-style-type: none">1. State receives required services per contractual agreement.2. Provides own staff and training to operate, maintain and replace Weather Center equipment and facilities.3. Contributes to multimodal response.4. Utilizes State telecommunications network.5. Costs must be offset by commercialization of travel information and advertising; familiar activities for the private sector.6. Trial program possible.	<ol style="list-style-type: none">1. Control by State limited by contractual agreement.2. Requires preparation of a contract without comparable precedent and State oversight.3. Not eligible for federal funding participation.4. Net cost to State could exceed Public Sector option.5. Success predicated on untested market demand.6. Failure of private sector could necessitate State takeover.7. Eliminates potential for synergy among State agencies to solve mutual objectives.8. State telecommunications network requires protection from unauthorized access.

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Source: QED.

Table 11-13
WEATHER CENTER ORGANIZATION
PUBLIC / PRIVATE PARTNERSHIP OPTION

Advantages

1. State receives required services per contractual agreement.
2. Eligible to receive federal funding participation.
3. Contributes to multimodal response.
4. Each partner contributes within area of control / specialization / capability to establish, operate, maintain and replace Weather Center.
5. Costs can be offset by commercialization of travel information and advertising.
6. Potential for intelligent transportation system demonstration program.
7. Trial program possible.

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Source: QED.

Disadvantages

1. Control by State limited by contractual agreement.
2. Requires preparation of a contract without comparable precedent and State oversight.
3. Net cost to State could exceed Public Sector option.
4. Success predicated on untested market demand.
5. Failure of private sector could necessitate State takeover.
6. State telecommunications network requires protection from unauthorized use.

Public Sector

The Weather Center serves not only the specific needs related to aviation system users, but also has applicability to a wide range of public and private sector entities throughout the State including the general public. The wide appeal of real-time weather data and value-added products and services speaks to the rationale for establishing the Weather Center through a central agency within State government. Possible entities to serve in this role are the Arizona departments of Agriculture, Commerce, Public Safety or Transportation and Arizona State University. Direct funding of any of these agencies to collect and disseminate the raw data as well as generate user-specific weather products and services presents a straight forward and logical extension of providing a public service. These or other State agencies could assist in the maintenance of the facilities and in the provision of the required telecommunications equipment. Internal State accounting practices could be utilized to track the allocation and use of funds. However, the public sector option is essentially a program funded by the State and, indirectly, through the collection of taxes imposed on its citizens and businesses operating in the State. The imposition of user fees or charges to offset all or a portion of the costs to establish, operate and maintain the Weather Center could be another means to raise the required capital. These options are a continuation of the traditional means of government responding to the needs of the public and allows for total control by the State.

Thus, the public sector option represents the scenario wherein a State agency, perhaps in cooperation with other State agencies, operates the Weather Center in such a manner as to provide users with the products and services they require to support their operations. These costs are expected to be outweighed by the gains in mobility, productivity and enhanced safety that are achieved by the users of the Weather Center.

Private Sector

As described in a previous section, the State could elect to contract out the establishment and operation of the Weather Center to the private sector. This action requires the careful preparation of bid documents including performance standards. The proposal request should allow for the private sector respondents to be creative and innovative in proposing potential solutions. The contract between the State and the private sector entity would establish the extent of control that could be exercised by the State.

Under this option, the entire facilities cost of the Weather Center, with the exception of the telecommunications network, is borne by the private sector inasmuch as federal funding for eligible components would not apply. Communications costs would likely continue to be made the responsibility of the State so that the private sector entity can utilize the extensive Statewide TRANSNET and Project EAGLE telecommunications network. State control over the telecommunications facilities also maintains security over the sensitive data and communications transmitted on the network. The private sector would recover its investment and allowance for profit by charging user fees or a subscription to those public and private sector entities requesting the information.

There are limited examples of the market for the sale of weather data. The "Weather Channel", a television program, provides continuous weather data on a nationwide, regional and local basis for subscribers to a cable television operator. Additional services are available for a fee based on the time length of a telephone call to a specific "Weather Channel" number. In the absence of revenue and cost data, one may assume that the service is profitable otherwise it would not be offered. Similar call-for-weather information services exist, but market data is held proprietary.

The cost to the private sector entity could be reduced by selling advertising space on the Weather Center. For example, each call for information would be greeted by a recording, or graphic display if by computer access, of an advertising announcement. Kiosk displays, strategically positioned in high traffic areas for use by the traveling public, could be used to include information on local area facilities (restaurants, hotels, attractions) each of which would pay a fee for this exposure.

Because State agencies would be contracting to receive certain weather data and value-added products and services (or obtain this information at no charge in return for providing the private sector entity with access to the State-maintained telecommunications network), the availability of such data in a State file could be construed as public information. This could dilute the potential market for the private sector by those interested in historical data, for example, and thus the contract between the State and the private sector entity would need to specify how this matter is to be resolved.

The use of the private sector is not necessarily the least costly option to the State inasmuch as it, together with other users, are paying indirectly to cover the costs of the Weather Center and an allowance for profit. Failure on the part of the private sector to perform could require the State to assume total control and financial responsibility, or provide operating subsidies over a period of time until the private sector entity reached a breakeven or marginal profit status.

The private sector has not enjoyed the benefit of learning from previous solicitations of this type because few have been offered by a governmental agency. Exploratory discussions with potential private sector entities should be conducted to gauge their level of interest and identify contractual terms that would present the potential for a "win-win" solution. These discussions could lead to a trial of the Weather Center concept limited to a regional application or an initial phase. This would test the feasibility of the concept and allow for fine-tuning of a longer term contract for expansion Statewide if the trial was found potentially viable. Additionally, a market research study could be funded by the State to identify the market and test the financial viability for commercialized real-time Weather Center products and services. Business faculty and student resources at Arizona State University or an outside market research firm could be utilized to conduct such a study.

Public/Private Partnership

This concept attempts to combine the benefits of a public-only and private-only establishment and operation of the Weather Center to meet individual objectives to achieve a common goal. The primary objective of the public sector is to employ the resources of the private sector to meet public operational needs. The private sector partner seeks to participate in a project activity that meets its strategic business objectives and provides a commensurate rate of return. This latter objective can be better achieved if certain costs can be reduced. For example, the private sector entity and/or State could fund the nonfederal share of the establishment costs of those components of the Weather Center. Given the planned extent and capabilities within the State telecommunications network, the State could accept responsibility for all communications costs. The private sector partner could be responsible for funding the operational costs including maintenance and facilities replacement and in the commercialization of the weather products and services. The role and responsibilities of each and ownership rights of the raw data collected and value-added products and services would be specified in the contract.

As in the case of the private sector-only concept, it may be prudent to consider a public/private partnership on a trial basis, perhaps as an intelligent transportation system (ITS) demonstration program, and after conducting market research and financial feasibility/commercial viability studies. In addition to taking advantage of potential federal funding participation, a trial public/private partnership would permit both parties to address not only the technical but the more abstract institutional challenges associated with the eventual deployment of a statewide weather network. Key institutional challenges relate to:

1. Lack of market information – The size of the market demand for these services by public and private sector entities. The public sector, aside from its own use of the weather data, is concerned about how this information will be used by the public and potential influences on travel behavior. The private sector is interested in these same issues from the marketing and level of service points of view, and equally focused on the economic return on its financial investment.
2. Inexperience in partnerships – Both the public and private sectors have limited experience in the formation and operation of partnerships to disseminate/commercialize travel information. The willingness of the private sector to enter into a partnership is affected by the extent to which the public sector recognizes the need to balance operating rights with market risk.

A trial program also indirectly provides input to the U.S. Department of Transportation in its role of facilitating the deployment of ITS technologies by the public and private sectors. This can lead to fundamental changes in the way transportation development has been conducted in the past throughout the country.